MONEY AND PRICES. II

IV. MONEY AND FARM PRODUCTS PRICES IN CHICAGO

The prices of the group of articles called "farm products" in the index numbers of wholesale prices prepared by the Bureau of Labor are largely taken from the Chicago markets. From these prices an index number was prepared of the prices of farm products in Chicago, monthly, for the period from 1899 to 1908. The list of products is as follows:

Barley choice to fancy
Cattle, steers, choice to fancy
Cattle, steers, good to choice
Corn, cash
Flaxseed, No. 1
Hay, timothy, No. 1
Hides, green salted packers
Hogs, heavy
Hogs, light
Oats, cash
Rye, No. 2
Sheep, wethers, good to fancy, native
Sheep, wethers, plain to choice, western
Wheat, contract grades

For the years 1902–8, the monthly index numbers for the different articles are given in the yearly reports of the Bureau of Labor on wholesale prices. For the years 1899 to 1901 the monthly index numbers are not given and hence they were computed from the actual prices as given in the reports.[1] The weekly high and low prices are given in these tables. The average monthly price was found by taking the arithmetic average of the means of the high and low prices of the weeks of the month. Then the index numbers of the various products were obtained by comparing the monthly price with the base price of each article as given by the Bureau of Labor. The average of the monthly index numbers for the various commodities so computed, or taken directly from the bulletins of the Bureau of Labor, was then calculated to obtain the index numbers of the prices of farm products which follow.

[1] *Bulletin of the Bureau of Labor*, No. 39 (March, 1902), 244 ff.

TABLE XXI

INDEX NUMBERS OF THE PRICES OF FARM PRODUCTS IN CHICAGO, MONTHLY, FROM 1899 TO 1908

(Average 1890–99 = 100)

Month	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908
January	98.6	104.1	111.5	131.2	118.2	110.5	120.7	118.7	128.5	132.8
February	99.6	112.3	112.9	130.9	119.3	116.8	122.6	119.1	134.8	129.8
March.....	99.5	111.2	114.9	132.0	122.1	119.7	125.5	120.0	135.6	137.7
April.....	102.3	116.5	117.0	137.6	121.5	120.3	126.6	123.5	137.9	140.4
May.....	103.3	112.6	117.7	140.7	119.6	119.8	124.7	125.8	142.6	140.2
June.....	101.6	111.4	115.6	140.2	117.5	120.6	124.7	129.2	146.6	135.6
July.....	102.8	110.2	118.8	143.5	111.6	119.8	116.3	126.4	142.2	139.3
August	100.6	107.5	121.8	131.3	110.9	119.8	122.8	124.5	142.6	139.0
September ...	104.2	108.7	120.5	125.6	112.5	120.2	118.6	126.0	148.8	139.3
October.....	103.1	108.2	121.6	124.1	109.1	119.7	119.4	126.6	149.2	137.1
November ...	103.0	111.1	122.0	118.8	102.9	121.7	118.0	125.7	130.3	137.6
December....	103.8	109.3	128.1	116.8	104.0	118.6	120.1	129.3	129.1	136.7

Statistics for the amount of specie and legal tenders and the amount of gross deposits in the Chicago Clearing House banks were taken from the publications of the National Monetary Commission.[1] The figures are given by weeks. The monthly figures were obtained as in the corresponding case of the New York statistics, by averaging the amounts for the four or five weeks which lie wholly or for most part within the month. In two instances for the period under consideration, where there should have been 53 weekly reports for the year, but 52 were given. As the quotations were not available elsewhere, the missing quotation, in one instance, was supplied by taking the mean of the previous and following quotations, and in the other, the quotation was simply dropped, since it came at the close of the last year considered. It is to be noted that gross deposits are considered instead of net deposits as was the case with the reports of the New York banks.

We will next compare the movement of the prices of farm products in Chicago with the movements of specie and legal tenders and of gross deposits in the banks of the Chicago Clearing House.

In no case is the degree of correspondence high; in two cases it is positive and in two cases, negative. In 56 cases out of 100 the movement of prices agrees with the movement of the specie and

[1] *Statistics for the United States, 1867–1909*, pp. 141–50.

TABLE XXII

CORRESPONDENCE OF THE MOVEMENT OF THE PRICES OF FARM PRODUCTS IN CHICAGO, MONTHLY, 1899–1908, WITH THE MOVEMENT OF THE AMOUNT OF SPECIE AND LEGAL TENDERS IN THE CHICAGO CLEARING HOUSE BANKS

MOVEMENT OF SPECIE AND LEGAL TENDERS FOR	CORRESPONDENCE			
	+	−	o	Degree
Second month previous	58	57	2	+.009
Previous month	65	51	2	+.119
Same month	53	64	2	−.092
Following month	50	66	2	−.136

legal tenders for the previous month, and in 57 cases out of 100 the price movement is in the opposite direction to the movement of specie and legal tenders for the following month.

TABLE XXIII

CORRESPONDENCE OF THE MOVEMENT OF THE PRICES OF FARM PRODUCTS IN CHICAGO, MONTHLY, 1899–1908, WITH THE MOVEMENT OF THE AMOUNT OF GROSS DEPOSITS IN THE CHICAGO CLEARING HOUSE BANKS

MOVEMENT OF GROSS DEPOSITS FOR	CORRESPONDENCE			
	+	−	o	Degree
Second month previous	59	56	2	+.026
Previous month	66	50	2	+.136
Same month	64	53	2	+.092
Following month	63	53	2	+.085
Second month following	59	56	2	+.026

Here the correspondence is all positive and not very high. The most occurs with the previous month, where in 57 cases out of 100 a movement in the amount of gross deposits is followed by a similar movement in the prices of farm products the next month.

To sum up: The maximum degree of correspondence is not high in the comparison of the movement of the prices of farm products in Chicago and the movements of specie and legal tenders and of gross deposits in the Chicago Clearing House banks. The highest correspondence of the movement of the prices of farm products comes with the movement for the previous month of specie and legal tenders and of gross deposits. This fact indicates that what little causal influence is shown runs from the specie and legal tenders and gross deposits to the prices of farm products.

V. MONEY AND SPECULATIVE PRICES ON THE CHICAGO BOARD OF TRADE

Speculative prices on the Chicago Board of Trade, weekly and monthly from 1899 to 1908, next engage our attention. Here is presented for the first time, it is believed, an index number of speculative prices. The Chicago market is taken because it is the most important speculative market for these commodities in the United States. The essence of the speculative market is the dealing in futures. The problem is not the same as at is when it is desired to construct an index number for actual prices; in such a case the usual method is to express the various prices as percentages of some base price, usually the average price for some period. Obviously, this method cannot be employed with speculative prices. In a sense, wheat to be delivered at different times in the future is not a single commodity but several commodities with different prices in the market, so that no one base price would be applicable to all. If statistics were available, an index number might be constructed of the price of wheat some definite time in advance of each date, e.g., an index number showing the variations in the price of wheat to be delivered in three months. But such statistics are not in existence.

To solve these difficulties the index number was made with a variable base, in the following manner. The Chicago Board of Trade, in its yearbook, gives the daily high and low prices for the speculative commodities dealt in on the Board of Trade. Six commodities are dealt in through the entire year, namely, wheat, corn, and oats, the prices of which are quoted in terms of bushels; mess pork, quoted in terms of barrels; and lard and short rib sides, quoted at so much per hundredweight. Rye and barley are also traded in, but only for part of the year. The prices of these commodities are quoted for delivery in various months in the future. The aim in computing the index number was to take the price in the future month in which there was the most trading. It was assumed that the movements in the price of delivery in that month could be taken as typical of the movements of speculative prices of that one commodity, for it is well known that the prices of the various months move in sympathy with each other. The prices for all the months of future delivery may not move in the same

direction when a harvest intervenes. But if there are two diverse movements, one depending on the expected harvest and the other on the stock in existence, we have as much right to take the one as typical as the other.

The following is the account of the future prices which were used for the typical year. From December to April, in the case of the grains, and from January to April, in the case of the pork products, the prices for May delivery were taken. By not taking the price of May wheat in May, and, in general, by not taking the price of any commodity for delivery in the current month, we eliminate most if not all of the price changes which are due to corners and also avoid the times when the cash and future prices are the same. From May to August, the prices of all of the commodities for September delivery were taken. From September to November, in the case of the grains, the quotations for December delivery were taken. In the case of the pork products, from September to December the quotations are for January delivery. In some cases, because of the lack of quotations, it was necessary to depart somewhat from the schedule as given above, but in every case the principle was followed of taking the quotation for some month in advance. With this general scheme in mind, we may now indicate in detail the method employed in computing the index numbers.

From the daily high and low quotations given in the yearbooks of the Chicago Board of Trade, the weekly high and low prices were obtained. The average of the high and low prices was taken as the price for the week. Then for each week was obtained the percentage which the price of that week was of the price of the preceding week. This is the familiar method of constructing chain index numbers or index numbers with a variable base. When there was a change of the month of future delivery considered, it was necessary to take two quotations for the last week of the month. For example, the index number for the last week in April was computed by comparing the price of May delivery for that week with the price of May delivery for the preceding week; the index number for the first week in May was obtained by comparing the price of September delivery for the first week of May with the price of September delivery for the last week of April. Thus for the last week in April, it was necessary to compute the prices of both

May and September deliveries. After the index numbers had been computed for each commodity for each week, the arithmetic mean was taken to obtain the index number for speculative prices for the week. It should be clearly understood that the table gives for each week a figure which indicates the change in speculative prices from the week before. No comparisons can be made directly from the table for longer periods.

TABLE XXIV

NUMBERS INDICATING THE PERCENTAGE OF CHANGE FROM THE PREVIOUS WEEK OF SPECULATIVE PRICES ON THE CHICAGO BOARD OF TRADE, 1899–1908.

THE YEAR BEGINS WITH THE WEEK ENDING—

Week	Jan. 7 1899	Jan. 6 1900	Jan. 5 1901	Jan. 4 1902	Jan. 10 1903	Jan. 9 1904	Jan. 7 1905	Jan. 6 1906	Jan. 5 1907	Jan. 4 1908
1.....	98.34	101.96	104.85	100.04	99.69	100.95	98.82	100.82	99.80	101.55
2.....	99.67	100.25	103.31	100.39	102.46	100.03	100.11	100.87	99.85	101.28
3.....	100.20	99.58	99.89	97.94	101.60	102.68	100.25	99.89	101.75	98.53
4.....	103.41	99.76	99.40	98.67	100.02	100.98	100.98	98.47	101.35	98.73
5.....	99.11	99.96	100.49	96.79	99.93	101.58	99.65	99.96	102.12	97.15
6.....	98.26	102.13	99.54	101.05	101.30	103.71	100.11	101.25	102.26	98.62
7.....	98.57	100.41	101.51	99.73	100.41	104.73	101.23	100.36	99.90	97.92
8.....	97.63	98.75	99.98	99.88	100.67	103.67	99.26	99.60	98.24	98.91
9.....	100.63	98.31	100.28	98.61	100.91	94.24	100.14	99.49	99.52	102.02
10.....	97.71	101.14	100.24	100.41	100.23	95.90	100.76	99.93	99.25	102.86
11.....	97.81	102.21	101.84	100.60	97.42	98.66	100.20	100.31	97.94	100.36
12.....	100.80	101.37	102.19	98.92	98.74	97.55	100.14	102.95	98.65	101.64
13.....	101.91	102.45	101.18	100.01	100.30	102.30	98.71	100.21	100.41	100.10
14.....	98.98	104.43	100.59	100.91	99.39	98.17	101.68	100.42	100.64	102.54
15.....	98.97	100.79	98.23	99.84	101.96	96.09	100.33	102.15	100.68	99.33
16.....	100.90	99.08	99.74	102.55	100.81	97.47	97.39	100.45	99.29	99.36
17.....	98.63	98.41	102.31	100.59	98.88	99.71	96.63	98.84	101.28	99.34
18.....	98.38	99.24	101.01	99.63	99.70	98.97	100.07	99.57	100.55	100.95
19.....	97.11	96.42	98.43	98.80	99.68	98.83	100.56	99.70	102.92	101.31
20.....	99.83	100.26	100.27	100.92	101.07	99.17	101.24	102.43	103.52	99.64
21.....	99.55	99.00	101.38	98.72	99.32	100.33	100.39	101.86	101.82	101.85
22.....	100.01	98.27	99.75	99.40	102.97	102.20	100.43	100.69	99.12	101.30
23.....	101.00	103.17	100.58	99.93	100.10	101.43	100.65	101.77	98.62	100.07
24.....	101.23	101.40	99.85	101.06	101.19	102.66	101.07	103.89	97.28	99.02
25.....	100.33	106.84	100.17	101.09	99.55	101.35	101.54	99.25	99.57	102.75
26.....	99.72	101.91	100.52	102.60	98.17	99.58	102.28	99.60	101.64	102.19
27.....	100.12	97.39	100.14	102.69	99.92	101.45	99.98	100.16	101.31	102.09
28.....	101.55	100.38	103.32	99.60	97.25	99.64	98.82	100.20	99.29	103.29
29.....	99.11	95.46	100.92	99.49	98.69	100.22	99.37	98.00	99.22	101.74
30.....	97.95	99.26	104.97	97.50	100.32	100.63	99.36	99.11	100.42	99.38
31.....	96.90	98.81	97.48	96.94	100.37	101.56	100.00	97.02	101.58	99.81
32.....	100.16	100.42	101.45	97.87	100.47	100.62	101.12	99.85	100.37	102.77
33.....	100.43	97.92	102.29	96.40	98.15	101.26	100.38	98.37	98.55	99.07
34.....	100.59	101.00	99.02	102.88	100.86	99.17	100.71	99.62	102.50	98.76
35.....	99.70	97.90	98.55	102.00	101.29	98.66	97.88	100.28	102.70	100.64
36.....	100.81	99.26	100.87	100.90	100.98	99.43	99.00	98.99	102.46	102.35
37.....	100.03	101.33	100.74	100.64	101.10	101.47	101.44	98.52	98.86	102.23
38.....	101.92	101.14	102.53	100.70	94.81	99.96	101.07	101.73	98.68	100.57
39.....	102.18	100.93	99.58	101.89	98.33	100.68	99.73	101.68	100.60	99.62
40.....	100.60	101.09	98.02	101.23	99.07	99.95	99.46	100.62	99.97	99.38
41.....	99.22	98.77	98.15	101.86	100.30	96.59	101.45	100.21	103.36	97.92
42.....	97.66	97.54	100.13	101.83	98.16	99.02	99.90	100.43	100.89	97.84
43.....	100.95	99.40	99.88	100.48	101.08	100.88	101.22	99.81	95.58	99.25
44.....	99.65	100.53	99.98	99.65	99.74	98.75	100.46	101.86	95.16	102.00
45.....	99.76	100.34	100.71	99.32	97.30	101.74	99.92	100.07	97.53	100.00
46.....	98.82	101.13	101.17	99.52	99.94	98.99	99.24	100.80	97.97	100.01
47.....	100.76	100.22	101.53	103.21	97.91	99.50	99.81	99.54	95.71	100.79
48.....	98.95	99.85	104.05	100.71	100.73	100.52	102.24	99.82	99.26	100.29
49.....	101.28	100.12	103.56	100.63	101.10	98.81	101.90	101.84	104.37	100.10
50.....	102.37	100.01	101.68	102.42	101.25	99.57	99.17	102.35	99.34	99.82
51.....	99.74	99.59	98.64	99.56	101.63	100.64	100.08	100.65	101.41	98.87
52.....	100.52	100.43	101.25	101.03	104.13	100.29	100.08	100.56	99.81	100.87
53.....	.....	.....	.....	99.94	.....	.....	.....	.....	.....	101.14

TABLE XXV

NUMBERS INDICATING THE PERCENTAGE OF CHANGE FROM THE PREVIOUS MONTH OF SPECULATIVE PRICES ON THE CHICAGO BOARD OF TRADE, 1899–1908

Month	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908
January...	.....	102.66	107.53	98.61	103.24	107.71	99.69	100.77	103.06	100.99
February..	99.02	101.08	101.37	96.31	102.71	110.14	101.05	100.35	104.38	93.76
March....	95.29	102.28	103.64	99.14	100.50	95.34	100.74	101.19	95.92	104.44
April.....	98.94	107.35	102.06	102.09	98.86	93.02	99.04	103.70	100.20	102.52
May	95.02	94.43	101.36	99.72	100.06	95.33	97.69	101.55	106.49	102.27
June	101.09	105.54	101.10	100.82	103.48	104.98	104.05	106.92	99.04	103.08
July.....	100.57	100.15	105.35	103.16	96.31	103.30	101.33	99.35	101.05	108.48
August ...	95.88	95.16	104.22	92.97	98.34	102.72	99.88	92.16	102.27	102.40
September.	102.69	99.19	101.56	104.26	100.11	99.72	99.62	98.46	103.99	103.85
October...	101.59	100.06	97.67	106.00	94.83	97.96	101.48	103.21	99.89	96.39
November.	98.01	100.29	102.99	101.84	97.13	98.71	101.54	101.89	88.61	101.03
December.	102.14	100.30	108.99	104.76	101.54	98.93	102.87	103.94	101.13	100.46

From the weekly index numbers a monthly index number was computed by putting the table into continuous form and averaging the index numbers of the four or five weeks which were wholly or for most part within the month and then expressing the figures so obtained as percentages of the figures of the month previous. So here again only the month to month comparison can be made directly from the table.

Tables XXIV and XXV show index numbers for speculative prices weekly and monthly.

We will first compare the weekly movement of speculative prices with the movements of specie and legal tenders and of gross deposits in the Chicago Clearing House banks, statistics for which

TABLE XXVI

CORRESPONDENCE OF THE MOVEMENT OF SPECULATIVE PRICES ON THE CHICAGO BOARD OF TRADE, WEEKLY, 1899–1908, WITH THE MOVEMENT OF SPECIE AND LEGAL TENDERS IN THE CHICAGO CLEARING HOUSE BANKS

MOVEMENT OF SPECIE AND LEGAL TENDERS FOR	CORRESPONDENCE			
	+	−	o	Degree
Third week previous	265	248	5	+.033
Second week previous	269	245	5	+.046
Previous week	262	253	5	+.017
Same week	252	263	5	−.021
Following week	256	259	5	−.006
Second week following	249	265	5	−.031
Third week following	257	256	5	+.002

were taken from the publications of the National Monetary Commission.[1]

On the basis of this table the safest generalization would seem to be that there is no relationship between the movement of speculative prices for the series of years considered and the movement of specie and legal tenders. Some cases show a slight positive correspondence and some, a slight negative correspondence, but there is not enough in either case to justify any statement of tendency.

The comparison with the movement of gross deposits comes next.

TABLE XXVII

CORRESPONDENCE OF THE MOVEMENT OF SPECULATIVE PRICES ON THE CHICAGO BOARD OF TRADE, WEEKLY, 1899–1908, WITH THE MOVEMENT OF GROSS DEPOSITS IN THE CHICAGO CLEARING HOUSE BANKS

MOVEMENT OF GROSS DEPOSITS FOR	CORRESPONDENCE			
	+	−	o	Degree
Second week previous	248	268	3	−.039
Previous week	261	256	3	+.010
Same week	253	264	3	−.021
Following week	265	252	3	+.025
Second week following	264	252	3	+.023

Here again the movement of the two sets of figures seems to be unrelated, for only slight correspondence is shown, and that shown is sometimes positive and sometimes negative.

TABLE XXVIII

CORRESPONDENCE OF THE MOVEMENT OF SPECULATIVE PRICES ON THE CHICAGO BOARD OF TRADE, MONTHLY, 1899–1908, WITH THE MOVEMENT OF THE AMOUNT OF SPECIE AND LEGAL TENDERS IN THE CHICAGO CLEARING HOUSE BANKS

MOVEMENT OF SPECIE AND LEGAL TENDERS FOR	CORRESPONDENCE			
	+	−	o	Degree
Second month previous	55	62	0	−.060
Previous month	64	54	0	+.085
Same month	64	55	0	+.076
Following month	63	55	0	+.068
Second month following	51	66	0	−.128

[1] *Statistics for the United States, 1867–1909*, pp. 141–50.

We will now compare the monthly movement of speculative prices with the movement of specie and legal tenders and with the movement of gross deposits of the Chicago Clearing House banks. The monthly figures for specie and legal tenders and gross deposits were obtained from the weekly figures previously used by taking the arithmetic mean of the figures for the four or five weeks which lie wholly or for most part within the month.

This comparison shows a small amount of positive correspondence, with not much difference between the amounts for the same, the previous, and the following month. The number of cases considered is small and therefore it may be that the negative correspondence with the second month previous and the second month following is due to chance.

We come now to the comparison with the movement of gross deposits.

TABLE XXIX

CORRESPONDENCE OF THE MOVEMENT OF SPECULATIVE PRICES ON THE CHICAGO BOARD OF TRADE, MONTHLY, 1899–1908, WITH THE MOVEMENT OF GROSS DEPOSITS IN THE CHICAGO CLEARING HOUSE BANKS

MOVEMENT OF GROSS DEPOSITS FOR	CORRESPONDENCE			
	+	−	0	Degree
Previous month	61	57	0	+.034
Same month	69	50	0	+.160
Following month	66	52	0	+.119

The correspondence of the movement of speculative prices with the movement of gross deposits for the same month is higher than that of any of the other comparisons we have made for speculative prices.

To sum up: We have compared the movement of speculative prices on the Chicago Board of Trade with the movements of specie and legal tenders and of gross deposits in the Clearing House banks of Chicago, using both weekly and monthly averages. Little or no correspondence is shown when the weekly averages are used. Practically we may say that the two weekly movements are unrelated. Slightly more correspondence is shown when the monthly averages are used. The greatest correspondence of movement

is that of the monthly index number of speculative prices and the average of gross deposits for the same month. In 58 out of 100 cases, the two movements agree in the direction of their changes. This maximum correspondence is lower than that obtained in the comparisons involving the monthly index numbers of bond prices and of stock prices. The correspondence is higher when the monthly movement of speculative prices is compared with the movement of gross deposits for the following month than when it is compared with the movement of gross deposits for the preceding month. We conclude, therefore, that the amount of gross deposits depends upon speculative prices more than speculative prices depend upon the amount of gross deposits.

VI. MONEY AND WHOLESALE PRICES IN THE UNITED STATES

The last price movement to be considered is that of wholesale prices of commodities in the United States. We wish to discover whether there is any relationship between this movement and the movement of the total money in circulation or of per capita circulation. For the period from 1900 to 1911, the Bureau of Labor has computed monthly index numbers of wholesale prices.[1] With this movement, we may compare the movement of total circulation for each month. The monthly figures for the amount of money in circulation previously used have been brought down through 1911 by obtaining the estimates of the total amount of money in circulation for the separate months from the *Monthly Summary of Commerce and Finance.*

TABLE XXX

CORRESPONDENCE OF THE MOVEMENT OF WHOLESALE PRICES IN THE UNITED STATES, MONTHLY, 1900–1911, WITH THE MOVEMENT OF THE TOTAL AMOUNT OF MONEY IN CIRCULATION IN THE UNITED STATES

MOVEMENT OF TOTAL CIRCULATION FOR	CORRESPONDENCE			
	+	−	o	Degree
Second month previous	80	53	10	+.189
Previous month	83	50	10	+.231
Same month	76	55	12	+.147
Following month	73	58	11	+.106

[1] *Bulletin of the Bureau of Labor*, No. 99 (March, 1912), 523.

A fair degree of correspondence is shown throughout, the greatest is in the comparison with the money in circulation for the previous month. The correspondence shown may be expressed by the statement that, in the period studied, in about 62 out of 100 cases a movement in total circulation is followed by a similar movement in wholesale prices the following month.

We next make the comparison with wholesale prices yearly from 1867 to 1911.[1] The Aldrich Report index numbers of wholesale prices are used for the period 1867–90,[2] and those of the Bureau of Labor for the period 1890–1911.[3] The figures for total and per capita circulation are the same as those used before, with the figures for the years 1910 and 1911 added from the *Statistical Abstract*.[4] Since specie payments were not resumed until 1879, the comparison is made in two forms, from 1867 to 1911 and from 1879 to 1911. Thus if desired, the period before the resumption of specie payments need not be considered. Both total circulation and per capita circulation are used in the comparison.

TABLE XXXI

CORRESPONDENCE OF THE MOVEMENT OF WHOLESALE PRICES IN THE UNITED STATES, YEARLY, 1867–1911, AND 1879–1911, WITH THE MOVEMENT OF THE PER CAPITA CIRCULATION OF MONEY IN THE UNITED STATES

MOVEMENT OF PER CAPITA CIRCULATION FOR	1867–1911 CORRESPONDENCE				1879–1911 CORRESPONDENCE			
	+	−	o	Degree	+	−	o	Degree
Second year previous	20	21	1	−.024	15	14	1	+.033
Previous year	27	15	1	+.279	18	12	1	+.194
Same year	27	16	1	+.250	19	12	1	+.219
Following year	22	20	1	+.047	16	14	1	+.065

A fair amount of correspondence is shown. The longer period shows more than the shorter, and there is a shifting of the maximum from the comparison with the previous year in the long period to the comparison with the same year in the short period.

[1] Cf. Hardy, "The Quantity of Money and Prices 1860–1891," *Journal of Political Economy*, III (March, 1895), 145.

[2] Laughlin, *Principles of Money*, p. 215.

[3] *Bulletin of the Bureau of Labor*, No. 99 (March, 1912), 523.

[4] *Statistical Abstract of the United States* for 1911, p. 580.

TABLE XXXII

CORRESPONDENCE OF THE MOVEMENT OF WHOLESALE PRICES IN THE UNITED STATES, YEARLY, 1867–1911, AND 1879–1911, WITH THE MOVEMENT OF THE TOTAL CIRCULATION OF MONEY IN THE UNITED STATES

MOVEMENT OF TOTAL CIRCULATION FOR	1867–1911 CORRESPONDENCE				1879–1911 CORRESPONDENCE			
	+	−	o	Degree	+	−	o	Degree
Previous year	21	21	1	o	15	15	1	o
Same year	23	20	1	+.068	18	13	1	+.156
Following year	23	19	1	+.093	18	12	1	+.194
Second year following	21	20	1	+.024	17	12	1	+.167

This result is different from that in the comparison with per capita circulation—here the shorter period shows higher correspondence than the longer period. However, the correspondence is not so high as in the comparison with per capita circulation. The greatest correspondence for both the longer and the shorter periods is found in the comparison with the following year.

These results throw an interesting light on Irving Fisher's proposal for a "compensated dollar." Suppose that the scheme were in operation and that the value of the dollar had become more or less than it should be. Then the amount of bullion necessary to procure a dollar at the mint or that would be given for a dollar at the mint would be lessened or increased. The effect of this change would be to increase or decrease the amount of money in circulation. Now the point is that prices would change in the direction desired in only 62 cases out of 100, if we may generalize from our past experience and if we take the greatest degree of correspondence shown in any of the present calculations involving the total circulation of money and wholesale commodity prices. In the other 38 cases out of the 100, a movement in the opposite direction from the one desired would take place. With such limited correspondence it would seem unwise to attempt to regulate the price level by the proposed means. If the price movement were long continued in one direction, perhaps other effects than those working directly through changes in the volume of money would be observable. At any rate a possibly new factor would be introduced.

We shall next test by the method of the Degree of Correspondence two attempts which have been made to prove the Quantity Theory of Money statistically. Kemmerer has given in Book II of his *Money and Credit Instruments in Their Relation to General Prices* a statistical proof of the Quantity Theory of Money in the form in which he supports it. His figures cover the period from 1879 to 1908. Kemmerer starts with the equation of exchange in the form $P_s = \frac{MR + CR_c}{NE + N_cE_c}$, in which

P_s = the average price of all goods exchanged for money or checks
M = the quantity of money in circulation
R = the number of times the money is turned over
N = the number of commodities exchanged by money
E = the number of times they are exchanged
C = the amount of checks
R_c = the number of times the checks are turned over
N_c = the number of commodities exchanged by checks
E_c = the number of times they are exchanged.

Values are found for the various terms on the right-hand side of the equation. In general, relative not absolute values are computed. The value of P_s is calculated from these figures and is called "relative circulation." The proof of the Quantity Theory of Money comes in comparing the figures for "relative circulation" with the index numbers obtained from actual prices. We shall test the closeness of the agreement between "relative circulation" and the index numbers of actual prices by the method of the Degree of Correspondence for both the direction and the amount of the change. The two series should move together exactly in order to prove that the theory holds in every case. Table XXXIII gives the two series of figures and the correspondence of the two series for the various years of the period and for the period as a whole.

For direction the figures show a high degree of correspondence, +.48. This is not perfect correspondence but indicates that the two series move together in the proportion of 74 out of 100 cases. However, when the amount as well as the direction of the change is considered, the correspondence is much less, only +.20.

TABLE XXXIII

CORRESPONDENCE OF THE MOVEMENT OF KEMMERER'S INDEX NUMBERS FOR RELATIVE CIRCULATION AND GENERAL PRICES

YEAR	RELATIVE CIRCULATION	GENERAL PRICES	CORRESPONDENCE		
			+	−	o
1879.....	99	86			
			.37	..	..
1880.....	107	105			
			..	..	o
1881.....	107	106			
			.75	..	..
1882.....	123	118			
			.85	..	..
1883.....	112	109			
			.96	..	..
1884.....	103	100			
			.49	..	..
1885.....	84	91			
			.55	..	..
1886.....	83	89			
			.05	..	..
1887.....	102	90			
			.45	..	..
1888.....	103	92			
			.91	..	..
1889.....	104	93			
			..	.84	..
1890.....	108	90			
			..	.64	..
1891.....	105	94			
			.75	..	..
1892.....	99	90			
			..	..	o
1893.....	119	90			
			.62	..	..
1894.....	102	82			
			..	.83	..
1895.....	104	80			
			.27	..	..
1896.....	103	77			
			.57	..	..
1897.....	96	74			
			.46	..	..
1898.....	113	80			
			..	..	o
1899.....	124	80			
			.05	..	..
1900.....	125	92			
			..	..	o
1901.....	136	92			
			..	..	o
1902.....	136	99			
			..	.27	..

TABLE XXXIII—*Continued*

Year	Relative Circulation	General Prices	Correspondence		
			+	−	o
1903.....	131	100			
			.43	..	..
1904.....	119	96			
			.41	..	..
1905.....	134	101			
			.43	..	..
1906.....	138	108			
			..	.97	..
1907.....	133	112			
			.10	..	..
1908.....	132	103			
			+9.47	−3.55	

For direction +19−5+(5×o) = +14÷29 = +.48, Degree of Correspondence.
For direction and amount +9.47−3.55+(5×o) = +5.92÷29 = +.20, Degree of Correspondence.

Irving Fisher in chap. xii of his *Purchasing Power of Money* has attempted the same sort of a statistical proof of the Quantity Theory of Money for the years 1896–1909. The period covered is not so well chosen as that covered by Kemmerer's figures, since it is shorter and includes only a period of generally rising prices. But in some of the details of the computation, Fisher has made a great advance over Kemmerer. The test of the Quantity Theory comes in comparing the index numbers obtained directly from actual prices with the results reached by solving the equation of exchange in the form used by Fisher for the price level. The Degree of Correspondence has been computed for these figures[1] and the table is repeated here. The table is constructed in the same manner as the preceding one. It gives the two series of numbers to be compared and the correspondence shown in the direction and the amount of movement.

For direction the correspondence is +.31 and for direction and amount it is +.23. It will be noted that the correspondence for direction only is less than that in Kemmerer's proof, being only about two-thirds as great. For direction and amount of movement, the correspondence in Fisher's proof is slightly greater than that

[1] Magee, "The Degree of Correspondence between Two Series of Index Numbers," *Quarterly Publications of the American Statistical Association*, XIII (June, 1912), 181.

TABLE XXXIV

CORRESPONDENCE OF THE MOVEMENT OF FISHER'S INDEX NUMBERS OF PRICES OBTAINED DIRECTLY AND INDIRECTLY

YEAR	DIRECTLY	INDIRECTLY	CORRESPONDENCE		
			+	−	o
1896.....	63	54			
			..	.43	..
1897.....	64	52			
			.41	..	..
1898.....	66	56			
			.52	..	..
1899.....	74	69			
			..	.18	..
1900.....	80	68			
			.43	..	..
1901.....	84	76			
			.75	..	..
1902.....	89	82			
			.26	..	..
1903.....	87	75			
			..	.29	..
1904.....	85	81			
			.35	..	..
1905.....	91	83			
			.78	..	..
1906.....	97	90			
			..	..	o
1907.....	97	86			
			..	.23	
1908.....	92	87			
			.58	..	..
1909.....	100	100			
			+4.08	−1.13	

+4.08−1.13+0=2.95÷13=+.23, Degree of Correspondence, considering amount and direction of change.

+8−4+0=4÷13=+.31, Degree of Correspondence, considering only the direction of the change.

of Kemmerer's. In neither case is much correspondence shown for direction and amount of movement; our inference is, then, that these two attempted proofs of the Quantity Theory of Money are far from being conclusive.

The import of these studies in the relation of the movement of the wholesale prices of commodities to the movement of money in circulation is clear. We may state it in alternative ways. Using tendency as the statement of what actually happens, we may say that the tendency of money and prices to move in the same direction shows itself in the proportion of from 55 to 64 out of 100

cases. Or using tendency in the sense of what will happen if not prevented, we may say that the tendency of prices to vary with the quantity of money is counteracted in from 36 to 45 out of 100 cases. If we conclude that the chief point of contention concerning the Quantity Theory of Money is the question of the proportionality of the change, then the opponents of the theory have the better of the argument so far as we can judge from these statistics.

In their statistical proofs of the Quantity Theory of Money, Kemmerer and Fisher have attempted to make allowance not only for the money, but also for the factors in the equation of exchange other than money. This attempt gives for Kemmerer's proof 74 cases out of 100 where the movements agree in direction, as compared with 64 cases of agreement out of 100 when allowance was not made for the other factors. However, Fisher's figures with such allowance do not show more correspondence for direction than the crude figures do. In both of the proofs, the correspondence for direction and amount of change is less than the correspondence for the direction of the change only. Since the degree of correspondence between the movement of the wholesale prices of commodities and the amount of money in circulation was not computed for both the direction and the amount of the change, we cannot compare the crude figures for direction and amount of change with the results obtained in the proofs of Fisher and Kemmerer.

On the question of whether the amount of money adjusts itself to the wholesale prices or whether wholesale prices adjust themselves to the amount of money, we find that in the case of the comparison of the movement of the wholesale prices of commodities with the yearly averages of the per capita circulation of money and the monthly averages of the total circulation of money, the price changes follow the changes in the amounts of money more frequently than the reverse. Thus these figures support Fisher's view that the price level is the passive element in the equation of exchange. On the other hand, the comparison of the movement of the wholesale prices of commodities with the yearly averages for total circulation of money indicates that changes in the amounts of money follow price changes more frequently than the reverse, thus supporting Laughlin's view. As was suggested before, the case is not exactly a test of Laughlin's contention, since his statement is that

the volume of the medium of exchange adjusts itself to the need for it. Thus, in so far as the money in circulation includes money used as a standard, the figures do not give us an exact test of Laughlin's statement.

VII. SUMMARY

By way of summary a tabulation is presented of the highest degrees of correspondence which were shown in the various comparisons which have been made. Where there is considerable of both positive and negative correspondence, the maximum of each kind is given.

I. Bond Price Movement
  1. Weekly
    a) +.199 with movement of specie and legal tenders for previous week
    b) +.212 with movement of net deposits for same week
  2. Monthly
    a) +.207 with movement of specie and legal tenders for same month
    b) +.357 with movement of net deposits for same month
    c) +.159 with movement of total circulation for previous month
      −.066 with movement of total circulation for following month
  3. Yearly
    a) +.500 with movement of specie and legal tenders for same year
      −.500 with movement of specie and legal tenders for following year
    b) +.611 with movement of net deposits for the same year
      −.278 with movement of net deposits for following year
    c) +.500 with movement of per capita and total circulation for same year

II. Stock Price Movement
  1. Monthly (Mitchell)
    a) +.130 with movement of specie and legal tenders for following month
      −.084 with movement of specie and legal tenders for second month following
    b) +.181 with movement of net deposits for following month
    c) +.075 with movement of total circulation for following month
  2. Yearly (Mitchell)
    a) +.474 with movement of specie and legal tenders for previous year
      −.111 with movement of specie and legal tenders for following year
    b) +.684 with movement of net deposits for previous year
      −.333 with movement of net deposits for following year
    c) +.263 with movement of total circulation for previous year and for same year
      —.158 with movement of total circulation for second year previous
    d) +.263 with movement of per capita circulation for same year and for previous year
      −.053 with movement of per capita circulation for following year and for second year previous

3. Yearly (Commons and Stone)
   a) +.545 with movement of total circulation for following year
   −.158 with movement of total circulation for third year previous
   b) +.524 with movement of per capita circulation for second year following
   −.100 with movement of per capita circulation for second year previous

III. Farm Products Price Movement
   a) −.136 with movement of specie and legal tenders for following month
   +.119 with movement of specie and legal tenders for previous month
   b) +.136 with movement of gross deposits for previous month

IV. Speculative Price Movement
   1. Weekly
      a) +.046 with movement of specie and legal tenders for second week previous
      −.021 with movement of specie and legal tenders for same week
      b) −.039 with movement of gross deposits for second week previous
      +.025 with movement of gross deposits for following week
   2. Monthly
      a) −.128 with movement of specie and legal tenders for second month following
      +.085 with movement of specie and legal tenders for previous month
      b) +.160 with movement of gross deposits for same month

V. Wholesale Price Movement
   1. Monthly
      a) +.231 with movement of total circulation for previous month
   2. Yearly 1867–1911
      a) +.279 with movement of per capita circulation for previous year
      b) +.093 with movement of total circulation for following year
   3. Yearly 1879–1911
      a) +.219 with movement of per capita circulation for same year
      b) +.194 with movement of total circulation for following year

VI. Tests of Statistical Proofs of the Quantity Theory of Money
   1. Kemmerer's
      a) +.48 for direction of movement
      b) +.20 for direction and amount of movement
   2. Fisher's
      a) +.31 for direction of movement
      b) +.23 for direction and amount of movement

Since we have pointed out at the close of each section the significance of the figures given, there remains merely the task of attempting to draw some general conclusions, although we recognize that it is rather dangerous to generalize from statements that

are not of equal value. The summary just given shows that, in general, positive correspondence is more common than negative. The cases of negative correspondence are probably due to some marked periodicity in one or the other set of figures. The highest degree of correspondence is +.684, that of the movement of Mitchell's yearly stock prices with the movement of net deposits in the New York Clearing House banks for the previous year. The lowest amount of positive correspondence which is the maximum for any of the comparisons is +.025, that of the movement of the weekly speculative prices on the Chicago Board of Trade with the movement of gross deposits in the Clearing House banks of Chicago for the following week. As regards frequency, the maximum correspondence comes when the comparison is made between the price movement and a movement of money in banks or in circulation or deposits in banks for a previous period, 12 times; for the same period, 11 times; and for a following period, 8 times. In two instances, two comparisons equally show the highest correspondence, so in summarizing each of the two is credited with the maximum.

We are interested in the relative amounts of correspondence shown when the price movement is compared with the movement of money or deposits in banks or money in circulation for preceding and for following weeks, months, or years (even though the maximum correspondence may be shown when the price movement is compared with the movement of money or deposits for the same week, month, or year). In 18 cases more correspondence is shown when the price movement is compared with the movement of money and deposits for a preceding year, month, or week than is shown when the comparison is made with a following year, month, or week. In 11 cases the reverse is true. It may be of interest to indicate how the instances of these two types are distributed among the investigations using weekly, monthly, and yearly averages and also among the investigations concerned with specie and legal tenders in banks, bank deposits, and total and per capita circulation of money. Of the cases where more correspondence is shown when the price movement is compared with the movement of money and deposits for a preceding than for a following unit of time, instances appear in investigations involving weekly averages 2 times, monthly averages 6 times, and yearly averages 10 times.

Instances of the opposite kind are found in investigations involving weekly averages 2 times, monthly averages 5 times, and yearly averages 4 times. Of the cases where more correspondence is shown when the price movement is compared with the movement of money and deposits for a preceding than for a following unit of time, instances occur in investigations involving specie and legal tenders in banks 7 times, bank deposits 3 times, total circulation of money 4 times, and per capita circulation of money 4 times. Instances of the opposite kind are found in investigations involving specie and legal tenders in banks once, bank deposits 5 times, total circulation of money 4 times, and per capita circulation of money once.

The following conclusions may be drawn from the individual studies and this summary. They refer, of course, only to the periods and the price movements studied.

First: The relation of price changes to changes in the amount of money in circulation and in banks and in the amount of deposits in banks varies with different groups of commodities. Moreover, in any particular group of commodities, the relation may be different when weekly, monthly, and yearly averages are considered.

Second: In no case was complete correspondence found between a price movement and the movement of money or deposits in banks or of money in circulation.

Third: In general, the correspondence is greater between price movements and the movement of money or deposits in banks or of money in circulation when the averages used cover longer periods than when they cover shorter periods.

Fourth: Some of the price movements in local markets show more correspondence with the movement of money and deposits in the local banks than is shown in the comparison of general prices throughout the country with the money in circulation in the whole country.

Fifth: The causal influence runs from money in circulation or in banks to prices more frequently than the reverse. On the other hand, the causal influence runs from prices to bank deposits more frequently than the reverse.

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